

WHAT IS CLAIMED IS:

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5 1. An image display apparatus comprising:  
a light source for supplying illumination light;  
a reflection type display device which reflects  
the illumination light and modulates the illumination  
light into image light;

an illumination optical system for guiding the  
illumination light to the reflection type display  
device;

10 a first optical member for directing the  
illumination light toward the reflection type display  
device;

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15 a second optical member including a secondary  
light source generating part generating a secondary  
light source with the illumination light emitted from  
said light source and a reflecting surface which guides  
illumination light other than illumination light  
directly incident on the secondary light source  
generating part among the illumination light emitted  
20 from said light source, to the secondary light source  
generating part, and from which the illumination light  
from the secondary light source emerges toward the  
first optical member; and

25 a projection optical system for guiding the image  
light to an observer.

2. An image display apparatus according to claim

1,

wherein the first optical member comprises a first surface on which the illumination light from the secondary light source is incident, a second surface which totally reflect the light incident from the first surface, and a third surface from which the light totally reflected by the second surface emerges toward the reflection type display device; and

the image light modulated by the reflection type display device again enters into the first optical member from the third surface, and emerges toward the projection optical system from the second surface.

3. An image display apparatus according to claim 1, wherein the secondary light source generating part is a diffusing surface.

4. An image display apparatus according to claim 1, wherein the secondary light source generating part is a reflecting and diffusing surface.

5. An image display apparatus according to claim 1, wherein the secondary light source generating part is a microlens group.

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6. An image display apparatus according to claim 1, further comprising a directional element that is

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arranged between the first optical member and the second optical member, and enhances directivity of illumination light that emerges from the second optical member and enters into the first optical member.

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7. An image display apparatus according to claim 1, further comprising:

a reflective-liquid-crystal display device as the reflection type display device; and

a polarizing member which makes the illumination light be polarized light, and/or performs analysis of the image light,

wherein the polarizing member is arranged in a position where a condition,  $I_1/I_0 < 0.1$  is satisfied with letting optical intensity of outdoor daylight entering from an observer side to the projection optical system on the reflective-liquid-crystal display device be  $I_0$  and letting optical intensity on the polarizing member be  $I_1$ .

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8. An image display apparatus according to claim 1, further comprising:

a reflective-liquid-crystal display device as the reflection type display device;

a first polarizing member which converts illumination light emerged from the second optical member into S-polarized light to be incident on the

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first optical member; and

a second polarizing member for analyzing the image light modulated by the reflective-liquid-crystal display device into P-polarized light.

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9. An image display apparatus according to claim 1,

wherein the projection optical system comprises an optical element having a plurality of optical surfaces;

10

and

at least one among the plurality of said optical surfaces is a reflecting surface and at least one is a rotationally asymmetrical surface.

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10. An image display apparatus comprising:

a light source for supplying illumination light;

a reflection type display device which reflects the illumination light and modulates the illumination light into image light; and

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an illumination optical system for guiding the illumination light to the reflection type display device; and

wherein the illumination optical system comprises:

a first optical member for directing the

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illumination light toward the reflection type display device; and

a second optical member including a reflecting

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surface which deflects a principal optical path of the illumination light from the light source and emitting the illumination light, reflected by the reflecting surface, toward the first optical member;

5        a projection optical system for guiding the image light to an observer.

11. An image display apparatus according to claim 10,

10        wherein the first optical member comprises a first surface on which the illumination light is incident, a second surface which totally reflects the light incident from the first surface, and a third surface from which the light totally reflected by the second surface emerges toward the reflection type display device; and

15        the image light modulated by the reflection type display device again enters into the first optical member from the third surface, and emerges toward the projection optical system from the second surface.

12. An image display apparatus according to claim 10,

25        wherein the reflecting surface of the second optical member is a secondary light source generating surface which generates a secondary light source with the illumination light emitted from said light source.

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13. An image display apparatus according to claim  
12,

wherein the second optical member has a reflecting  
surface which guides illumination light other than  
5 illumination light, directly incident on the secondary  
light source generating surface, to the secondary light  
source generating surface among the illumination light  
from said light source.

10 14. An image display apparatus according to claim  
10, further comprising a directional element that is  
disposed between the first optical member and the  
second optical member, and enhances directivity of  
illumination light emerged from the second optical  
15 member and entering into the first optical member.

15. An image display apparatus according to claim  
10, further comprising:

a reflective-liquid-crystal display device as the  
reflection type display device; and

a polarizing member which makes the illumination  
light be polarized light, and/or performs analysis of  
the image light,

wherein the polarizing member is arranged in a  
25 position where a condition,  $I_1/I_0 < 0.1$  is satisfied  
with letting optical intensity of outdoor daylight  
entering from an observer side to the projection

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optical system on the reflective-liquid-crystal display device be IO and letting optical intensity on the polarizing member be I1.

5           16. An image display apparatus according to claim 10, further comprising:

          a reflective-liquid-crystal display device as the reflection type display device;

10           a first polarizing member which converts the illumination light emerged from the second optical member into S-polarized light to be incident on the first optical member; and

          a second polarizing member for analyzing the image light modulated by the reflective-liquid-crystal display device into P-polarized light.

15           17. An image display apparatus according to claim 10,

          wherein the projection optical system comprises an optical element having a plurality of optical surfaces, and

20           at least one among the plurality of the optical surfaces is a reflecting surface and at least one is a rotationally asymmetrical surface.

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          18. An image display apparatus comprising:  
          the image display apparatus according to any one

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of claims 1 and 10; and

an image information output apparatus for supplying image information to the image display apparatus.

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19. An optical system comprising:

an illumination optical system for guiding illumination light to a reflection type display device; and

10 wherein the illumination optical system comprises:

a first optical member for directing the illumination light toward the reflection type display device;

15 a second optical member including a secondary light source generating part which generates a secondary light source with the illumination light emitted from said light source and a reflecting surface which guides illumination light, other than illumination light directly incident on the secondary

20 light source generating part among the illumination light emitted from said light source, to the secondary light source generating part, and from which the illumination light from the secondary light source emerges forward the first optical member; and

25 a projection optical system for guiding the image light, reflected by the reflection type display device, to an observer.

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20. An optical system comprising:  
an illumination optical system for guiding  
illumination light to a reflection type display device;  
and

5 wherein the illumination optical system comprises:

a first optical member for directing the  
illumination light toward the reflection type display  
device; and

10 a second optical member that includes a  
reflecting surface which deflects a principal optical  
path of illumination light from the light source and  
emits the illumination light, reflected by the  
reflecting surface, toward the first optical member;

15 a projection optical system for guiding image  
light, reflected by the reflection type display device,  
to an observer.

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